RoHS COMPLIANT 2002/95/EC

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# Single Output
## UWR Models

## Miniature, 1" x 1"
## 5 Watt, DC/DC Converters

### Features

- Small size, 1" x 1" x 0.45"
- Full 5 Watts output power
- No external components required
- Drop-in replacements for many standard, 2" x 1" DC/DC's
- Wide input voltage ranges: 18-36V or 36-72V
- 5, 12, or 15V outputs
- Guaranteed efficiencies to 80%
- Fully regulated and isolated (1000Vdc guaranteed)
- Output overvoltage protection and current limiting
- –25 to +95°C operating temperature
- Shielded cases (5 sides)
- UL 1950, CSA 22.2 No. 234, IEC 950
- Modifications and customs for OEM's

The migration to distributed power is accelerating. The critical need for accurate voltages, tight regulation and rapid transient response is propelling the move to power processing at the "point-of-use" with low-power DC/DC converters physically located right at their loads.

DATEL's miniature, full featured, 5 Watt UWR Models were specifically designed for today's demanding distributed power architectures in aerospace, marine, telecom and computer applications. The converters' low cost, small size (1" x 1" x 0.45") and full 5 Watt output capability give system architects unprecedented design and layout flexibility.

Occupying less than 0.5in$^3$ total volume, these extremely compact, fully regulated and isolated (1000Vdc guaranteed) modules are available with either 5, 12 or 15 Volt outputs. Input voltage ranges are either 18-36 Volts ("D24" models) or 36-72 Volts ("D48" models).

Although their overall size is 50-75% smaller than many similarly rated power modules, these 1" x 1" UWR Models are exact, drop-in, pin-for-pin replacements for many standard 2" x 1" and 2" x 2", 5 Watt modules. They achieve their small size and low cost by exploiting a novel feedback approach that does not depend upon traditional optocoupler techniques.

All models are 5-side shielded and have a non-conductive baseplate that permits pc-card runs to be placed beneath the package. Units are assembled using high-speed automated SMT techniques and are fully encapsulated with thermally conductive potting compound. Every unit is electrically tested before and after encapsulation, 100% burned-in under full load, hi-pot tested, and final-electrical tested prior to shipment. Every unit meets DATEL's traditional high standards for quality and long-term reliability.

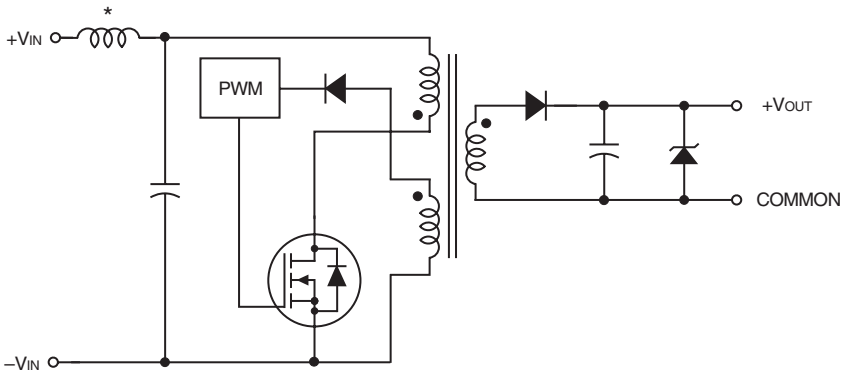



**Figure 1. Simplified Schematic**

* "D24" models only

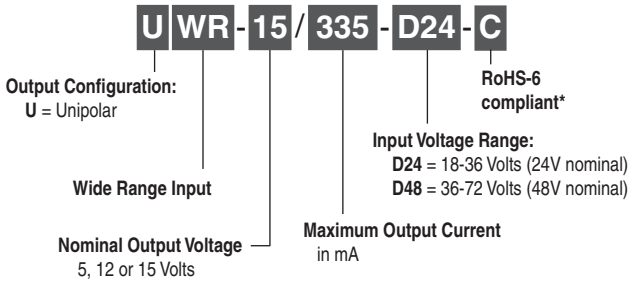
Typical topology is shown

## Performance Specifications and Ordering Guide ①

| Model | Output | | | | | Input | | | Efficiency (Min.) | Package (Case, Pinout) |
|---|---|---|---|---|---|---|---|---|---|---|
| | $V_{OUT}$ (Volts) | $I_{OUT}$ (mA, Max.) | Ripple/Noise ② (mVp-p, Max.) | Regulation (Max.) Line | Regulation (Max.) Load ③ | $V_{IN}$ Nom. (Volts) | Range (Volts) | $I_{IN}$ ④ (mA, Max.) | | |
| **UWR-5/1000-D24** | 5 | 1000 | 120 | ±2% | ±2% | 24 | 18-36 | 25/282 | 75% | C7, P3 |
| **UWR-5/1000-D48** | 5 | 1000 | 120 | ±2% | ±2% | 48 | 36-72 | 25/141 | 75% | C7, P3 |
| **UWR-12/420-D24** | 12 | 420 | 150 | ±2% | ±2% | 24 | 18-36 | 25/265 | 80% | C7, P3 |
| **UWR-12/420-D48** | 12 | 420 | 150 | ±2% | ±2% | 48 | 36-72 | 25/133 | 80% | C7, P3 |
| **UWR-15/335-D24** | 15 | 335 | 150 | ±2% | ±2% | 24 | 18-36 | 25/264 | 80% | C7, P3 |
| **UWR-15/335-D48** | 15 | 335 | 150 | ±2% | ±2% | 48 | 36-72 | 25/132 | 80% | C7, P3 |

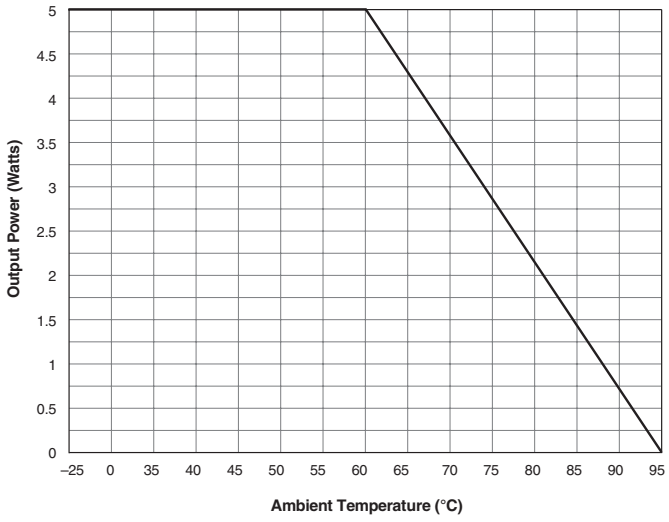
① Typical at $T_A$ = +25°C under nominal line voltage and full-load conditions unless otherwise noted.
② Ripple/Noise (R/N) measured over a 20MHz bandwidth.
③ 20% to 100% load.
④ Nominal line voltage, no-load/full-load conditions.

## PART NUMBER STRUCTURE

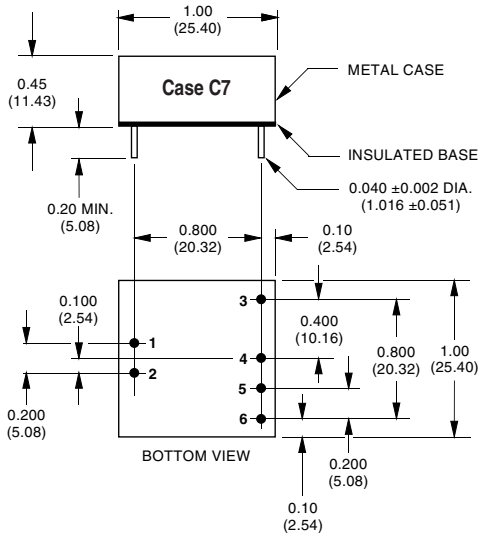



* Contact C&D Technologies (Datel) for availability.

## TEMPERATURE DERATING




## MECHANICAL SPECIFICATIONS




| I/O Connections | |
|---|---|
| Pin | Function P3 |
| 1 | +Input |
| 2 | –Input |
| 3 | +Output |
| 4 | No Pin |
| 5 | No Pin |
| 6 | Common |

**Notes:**

For "D24" models, the case is connected to pin 2 ($-V_{IN}$).

For "D48" models, the case is connected to pin 1 ($+V_{IN}$).

## Performance/Functional Specifications

Typical @ $T_A$ = +25°C under nominal line voltage and full-load conditions, unless noted. ①

| | |
|---|---|
| **Input** | |
| **Input Voltage Range:** | |
| "D24" Models | 18-36 Volts (24V nominal) |
| "D48" Models | 36-72 Volts (48V nominal) |
| **Input Current** | See Ordering Guide |
| **Input Filter Type** ② | LC on "D24" models<br>C on "D48" models |
| **Reverse-Polarity Protection** | Yes (Instantaneous, 6A maximum) |
| **Output** | |
| $V_{OUT}$ **Accuracy** (50% load): | |
| 5V Outputs | ±1.5%, maximum |
| 12/15V Outputs | ±1%, maximum |
| **Temperature Coefficient** | ±0.02% per °C |
| **Ripple/Noise** (20MHz BW) ② | See Ordering Guide |
| **Line Regulation** | See Ordering Guide |
| **Load Regulation** | See Ordering Guide |
| **Efficiency** | See Ordering Guide |
| **Isolation Voltage** ③ | 1000Vdc, minimum |
| **Current Limiting** | Auto-recovery |
| **Overvoltage Protection** | Zener/transorb clamp |
| **Dynamic Characteristics** | |
| **Transient Response** (50% load step) | 500µsec max. to ±2% of final value |
| **Switching Frequency** | 170kHz (±10kHz) |
| **Environmental** | |
| **Operating Temperature** (Ambient): ④ | |
| Without Derating | –25 to +60°C |
| With Derating | to +95°C (See Derating Curve) |
| **Storage Temperature** | –55 to +125°C |
| **Flammability** | UL94V-0 |
| **Physical** | |
| **Dimensions** | 1" x 1" x 0.45" (25.4 x 25.4 x 11.4mm) |
| **Shielding** | 5-sided |
| **Case Connection:** | |
| "D24" Models | Pin 2 ($-V_{IN}$) |
| "D48" Models | Pin 1 ($+V_{IN}$) |
| **Case Material** | Corrosion resistant steel with non-conductive,epoxy-based, black enamel finish and plastic baseplate |
| **Pin Material** | Gold plate over copper alloy |
| **Weight** | 0.7 ounces (20 grams) |

① These power converters require a minimum 20% loading to maintain specified regulation. Operation under no-load conditions will not damage these devices; however they may not meet all listed specifications.
② Application-specific input/output filtering can be recommended and perhaps added internally upon request. Contact DATEL Applications Engineering for details.
③ Units can be screened or modified for higher guaranteed isolation voltages. Contact DATEL Applications Engineering for details.
④ Units can be warranted or screened for lower-temperature operation. Contact DATEL Applications Engineering for details.

| Absolute Maximum Ratings | |
|---|---|
| **Input Voltage:** | |
| "D24" Models | 40 Volts |
| "D48" Models | 80 Volts |
| **Input Reverse-Polarity Protection** | Current must be < 6A. Brief duration only. Fusing recommended. |
| **Output Overvoltage Protection:** | |
| 5V Outputs | 6.8 Volts, limited duration |
| 12V Outputs | 15 Volts, limited duration |
| 15V Outputs | 18 Volts, limited duration |
| **Output Current** | Current limited. Max. current and short-circuit duration are model dependent. |
| **Storage Temperature** | –55 to +125°C |
| **Lead Temperature** (soldering, 10 sec.) | +300°C |

These are stress ratings. Exposure of devices to any of these conditions may adversely affect long-term reliability. Proper operation under conditions other than those listed in the Performance/Functional Specifications Table is not implied.

## TECHNICAL NOTES

### Floating Outputs

Since these are isolated DC/DC converters, their outputs are "floating." Users may ground either the Common (pin 6) for normal usage or the positive side (+Output, pin 3) to effectively reverse the output polarity.

### Filtering and Noise Reduction

All UWR 5 Watt DC/DC Converters achieve their rated ripple and noise specifications without the use of external input/output capacitors. In critical applications, input/output ripple and noise may be further reduced by installing low-ESR, tantalum or electrolytic capacitors across the input and/or output terminals. The capacitors should be located as close to the power converters as possible. Typical values are listed below. In many applications, using values greater than those listed will yield better results.

**To Reduce Input Ripple**

| | |
|---|---|
| "D24" Models | 20µF, 50V |
| "D48" Models | 10µF, 100V |

**To Reduce Output Ripple**

| | |
|---|---|
| 5V Outputs | 47µF, 10V, Low ESR |
| 12/15V Outputs | 33µF, 20V, Low ESR |

In critical, space-sensitive applications, DATEL may be able to tailor the internal input/output filtering of these units to meet your specific requirements. Contact our Applications Engineering Group for additional details.

### Input Fusing

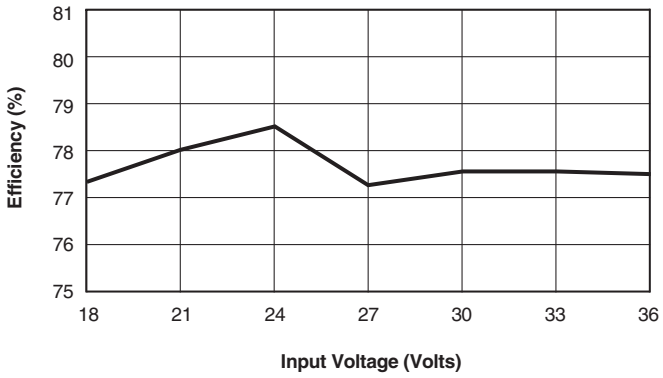
Certain applications and/or safety agencies may require the installation of fuses at the inputs of power conversion components. For DATEL UWR 5 Watt DC/DC Converters, you should use slow-blow type fuses with values no greater than 0.5A.

## Typical Performance Curves ($T_A$ = +25°C)

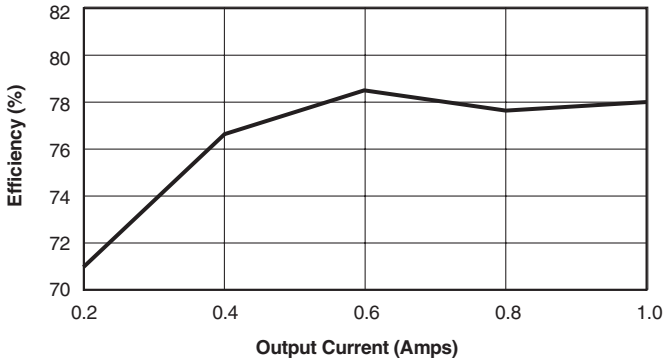
The performance curves below were derived from actual test data for a single model number (UWR-5/1000-D24).
Since all devices in this Series have the same circuit topology, the performance curves are representative of all devices.

### EFFICIENCY VS. INPUT VOLTAGE AND OUTPUT LOAD

**Efficiency vs. Input Voltage**
(Full-load conditions. Guaranteed efficiency = 75% at $V_{IN}$ = 24V )

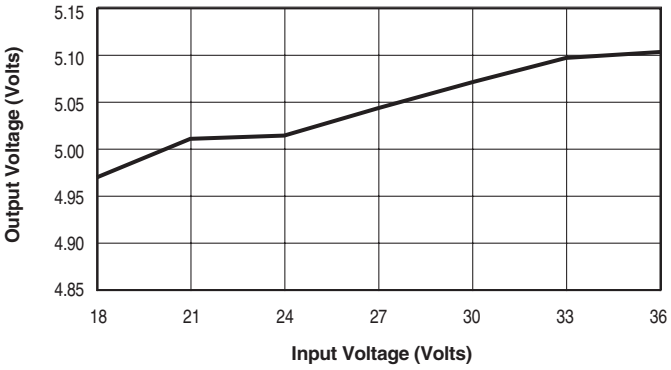



**Efficiency vs. Output Load**
($V_{IN}$ = nominal = 24V. Guaranteed efficiency at full load = 75%)



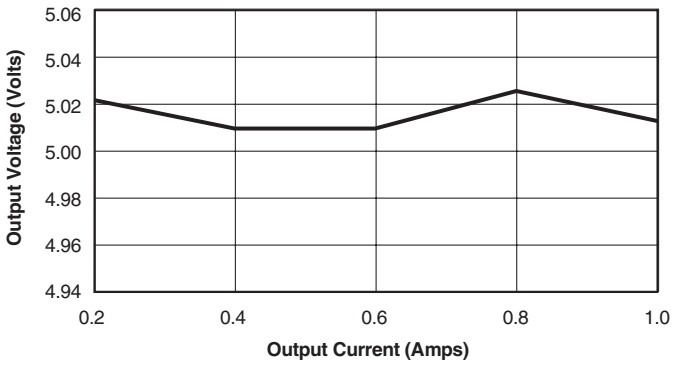

### LINE REGULATION

**Output Voltage vs.Input Voltage**
(Full-load conditions. No mi nal $V_{OUT}$ = 5V)




### LOAD REGULATION

**Output Voltage vs. Output Load**
($V_{IN}$ = nominal = 24V. Nominal $V_{OUT}$ = 5V)



## CUSTOM CAPABILITIES

DATEL's world-class design, development and manufacturing team stands ready to work with you to deliver the exact power converter you need for your demanding, large volume, OEM applications. And ... we'll do it on time and within budget!

Our experienced applications and design staffs; quick-turn prototype capability; highly automated, SMT assembly facilities; and in-line SPC quality-control techniques combine to give us the unique ability to design and deliver any quantity of power converters to the highest standards of quality and reliability.

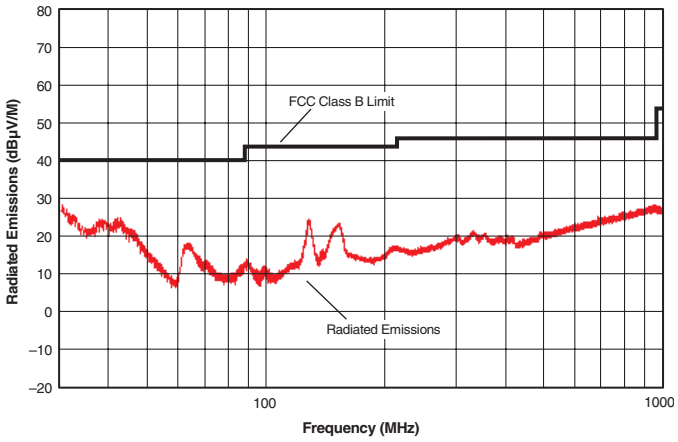
We have compiled a large library of DC/DC designs that are currently used in a variety of telecom, medical, computer, railway, aerospace and industrial applications. We may already have the converter you need.

Contact us. Our goal is to provide you the highest-quality, most cost-effective power converters available.

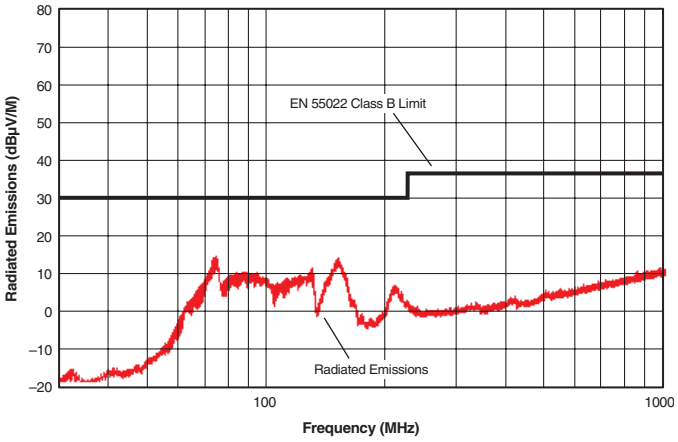
## EMI RADIATED EMISSIONS

If you're designing with EMC in mind, please note that all of DATEL's UWR 5 Watt DC/DC Converters have been characterized for radiated and conducted emissions in our new EMI/EMC laboratory. Testing is conducted in an EMCO 5305 GTEM test cell utilizing EMCO automated EMC test software. Radiated emissions are tested to the limits of FCC Part 15, Class B and CISPR 22 (EN 55022), Class B. Correlation to other specifications can be supplied upon request. Radiated emissions plots to FCC and CISPR 22 for model UWR-5/1000-D24 appear below. Its performance is typical of all models in the Family. Published EMC test reports are available for each model number. Contact DATEL's Applications Engineering Department for details.

**UWR-5/1000-D24 Radiated Emissions**
**FCC Part 15 Class B, 3 Meters**
**Converter Output = 5Vdc @ 800mA**




**UWR-5/1000-D24 Radiated Emissions**
**EN 55022 Class B, 10 Meters**
**Converter Output = 5Vdc @ 800mA**



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